

GCSE Combined Science: Trilogy

Worksheet: Diamond

TIME 25 min	TOTAL 23 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Diamond

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0 1

Diamond is a form of carbon with a giant covalent structure.

0 1 . 1

Why is diamond used for the cutting edges of some industrial saws?

Tick (✓) **one** box.

It is extremely hard.

☐

It conducts electricity.

☐

It is a good lubricant.

☐

It dissolves in water.

☐

[1 mark]

0 2

Diamond is a form of carbon.

0 2 . 1

How many covalent bonds does each carbon atom form in diamond?

.....

.....

.....

[1 mark]

0 2 . 2

Diamond is used in the tips of drills.

Which property makes diamond suitable for this use?

Tick (✓) **one** box.

It is very hard.

☐

It conducts electricity.

☐

It is shiny.

☐

It dissolves in water.

☐

[1 mark]

0 2 . 3

Why does diamond not conduct electricity?

Tick (✓) **one** box.

It has no delocalised electrons.

☐

It has no covalent bonds.

☐

Its molecules are too small.

☐

Its ions cannot move.

☐

[1 mark]

0 2 . 4

What type of structure does diamond have?

.....

.....

.....

.....

[1 mark]

0 3

A technician wants to confirm that a clear gemstone is diamond, rather than a glass imitation.

0 3 . 1

Describe a test based on hardness that could help confirm that the gemstone is diamond. Explain the result that would support this.

.....

.....

.....

.....

[2 marks]

0 4

A jeweller wants to check that a clear stone is a diamond.

0 4 . 1

The stone scratches glass.
Explain why this result is consistent with the stone being a diamond.

.....

.....

.....

.....

[2 marks]

0 4 . 2

The stone does not conduct electricity.
Explain why this result is consistent with the stone being a diamond.

.....

.....

.....

.....

[2 marks]

0 4 . 3

Diamond burns when it is heated strongly in oxygen.
Name the product.

.....

.....

.....

.....

[1 mark]

0 5

Diamond is described as having a giant covalent structure. Its formula is written simply as C.

0 5 . 1

Explain what is meant by a giant covalent structure.

.....

.....

.....

.....

[2 marks]

0 5 . 2

Explain why the formula of diamond is written as C, rather than as a molecule such as C₆₀.

.....

.....

[1 mark]

0 5 . 3

Explain why diamond has a much higher melting point than methane, CH₄, even though both contain covalent bonds.

.....

.....

.....

.....

[2 marks]

0 6

Diamond is a form of carbon.

0 6 . 1

Explain why diamond is very hard.

.....

.....

.....

.....

[2 marks]

0 6 . 2

Explain why diamond has a very high melting point.

.....

.....

.....

.....

[2 marks]

0 6 . 3

Explain why diamond does not conduct electricity.

.....

.....

.....

.....

[2 marks]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Diamond · 23 marks

Question 1 (1 mark)

01.1 [1 mark]

Correct: It is extremely hard.

Question 2 (4 marks)

02.1 [1 mark]

Answer: 4

- 4 (1)
-

02.2 [1 mark]

Correct: It is very hard.

02.3 [1 mark]

Correct: It has no delocalised electrons.

02.4 [1 mark]

Answer: giant covalent

- giant covalent (1)
-
-

Question 3 (2 marks)

03.1 [2 marks]

Answer: Try to scratch glass with the gemstone (or try to scratch the gemstone with quartz or a steel file); diamond scratches glass easily and is not scratched itself, because it is extremely hard.

- try to scratch glass with the gemstone / try to scratch the gemstone with a hard material such as quartz or steel (1)
 - diamond scratches glass easily and is not scratched itself, because diamond is extremely hard (glass would be scratched) (1)
-

Question 4 (5 marks)

04.1 [2 marks]

Answer: Diamond is very hard because each carbon atom is held by four strong covalent bonds in a rigid structure.

- diamond is very hard (1)
- because each carbon atom is joined to four others by strong covalent bonds / rigid giant structure (1)

04.2 [2 marks]

Answer: In diamond all the outer electrons are used in covalent bonds, so there are no delocalised electrons or other charged particles free to move.

- all the outer electrons are used in bonding / there are no delocalised electrons (1)
- so there are no charged particles free to move (1)

04.3 [1 mark]

Answer: carbon dioxide

- carbon dioxide (1)

Notes: Allow CO₂. Do not accept carbon monoxide.

Question 5 (5 marks)

05.1 [2 marks]

Answer: A very large number of atoms joined to each other by covalent bonds in a continuous network, with no separate molecules.

- a very large number of atoms joined by (strong) covalent bonds (1)
- in a continuous network / lattice, with no separate molecules (1)

05.2 [1 mark]

Answer: There are no separate molecules in diamond; the number of atoms depends only on the size of the crystal.

- there are no separate molecules / the number of atoms joined together depends on the size of the crystal (1)

05.3 [2 marks]

Answer: Melting diamond means breaking many strong covalent bonds; melting methane only overcomes weak intermolecular forces between small molecules.

- to melt diamond, many strong covalent bonds must be broken (1)
- to melt methane, only weak intermolecular forces between the molecules are overcome (the covalent bonds do not break) (1)

Question 6 (6 marks)

06.1 [2 marks]

Answer: Each carbon atom is joined to four others by strong covalent bonds in a rigid three-dimensional structure.

- each carbon atom is bonded to four other carbon atoms by strong covalent bonds (1)
- (in a) rigid / 3D giant structure (1)

06.2 [2 marks]

Answer: There are many strong covalent bonds, which need a lot of energy to break.

- many strong covalent bonds (1)
- a lot of energy is needed to break them (1)

Notes: Do not accept intermolecular forces.

06.3 [2 marks]

Answer: All four outer electrons of each carbon atom are used in covalent bonds, so there are no delocalised electrons.

- all four outer electrons (of each carbon atom) are used in covalent bonds (1)
- so there are no delocalised electrons / charged particles free to move (1)